CASE REPORT

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Application of Monitored Anesthesia Care Using Dexmedetomidine to Common Oral and Maxillofacial Trauma Cases

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Oral and maxillofacial surgery (OMFS) trauma cases are commonly treated under general anesthesia. The purpose of this case report is to introduce an alternative method of anesthesia in patients who refuse general anesthesia. A combination of dexmedetomidine and ketamine for sedation anesthesia in 3 frequent fracture types in the field of OMFS—Le Fort I fracture, mandibular fracture, and alveolar bone fracture—was used. Dexmedetomidine as the single agent has not shown stable success rates for invasive procedures. To overcome some of the pitfalls with dexmedetomidine, combination sedation using ketamine was performed. Visual analogue scale scores were recorded postoperatively. Dexmedetomidine combined with ketamine administration provided safe and effective sedation and anxiolysis for surgical reduction and internal fixation of OMFS fractures. It showed advantages of decreased admission time, reduced expenses, minimal pain, and reduced anesthetic burden for the patient thus ultimately increasing overall satisfaction.

Key Words: Anesthesia; Dexmedetomidine; Fracture reduction; Ketamine; Maxillofacial surgery

Introduction

Oral and maxillofacial surgery (OMFS) trauma cases are commonly treated under general anesthesia. Due to the development of medicine and monitoring equipment, the range of Monitored Anesthesia Care (MAC) is increasing because of its lowered cost, shortened admission period and reduced anesthetic burden for the patient. While generally an effective sedation method for noninvasive procedures, dexmedetomidine as the sole agent has not been uniformly successful for

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invasive procedures[1]. To overcome such problems of response failure, the usual dosage must be altered or supplemented with alternative agents. However, many studies have shown that elevation in dose may cause a higher incidence of hemodynamic side effects such as bradycardia and hypotension. Therefore we focused on applying ketamine as the alternative agent to cover invasive procedures while reducing the side effects of dexmedetomidine. We hereby report and evaluate a combination of dexmedetomidine and ketamine for sedation during 3 frequent OMFS fracture type cases; Le Fort I fracture, mandibular fracture, and alveolar bone fracture.

Case Report

1. Case 1: Le Fort I Fracture

A 52-year-old man who had no previous medical history was referred to the Department of Oral and Maxillofacial Surgery with oral and facial lacerations due to a bicycle accident on the same day. The patient had pain on both paranasal areas. Intraoral examinations showed tooth avulsions and crown fractures. Radiographical examination using the computed tomography (CT) scans showed Le Fort I fracture on both portions of the maxilla (Fig. 1).

The patient was apprehensive of general anesthesia and insisted on a less invasive anesthesia procedure. MAC using dexmedetomidine and ketamine was used for open reduction and internal fixation (ORIF) of the maxilla. Sedation was initiated with a bolus dose of continuous infusion dexmedetomidine (1 μg/kg) mixed with 100 ml of saline for ten minutes and ketamine (1 mg/kg) intravenously administered 1 minute before incision. Maintenance of sedation was done by continuous infusion of dexmedetomidine (0.3~0.7 μg/kg/h) adjusted accordingly with the patient's response. ORIF using a 4-hole absorbable plate and 4 screws under a maxillary vestibular intraoral approach took less than one hour. Perioperatively, there were no significant events and stable respiration was maintained with only minimal movement of the patient during stimulation. Postoperatively, the patient mentioned that he had

Fig. 1. Computed tomography image shows Le Fort I fracture on both portions of the maxilla with multiple teeth avulsions and crown fractures.

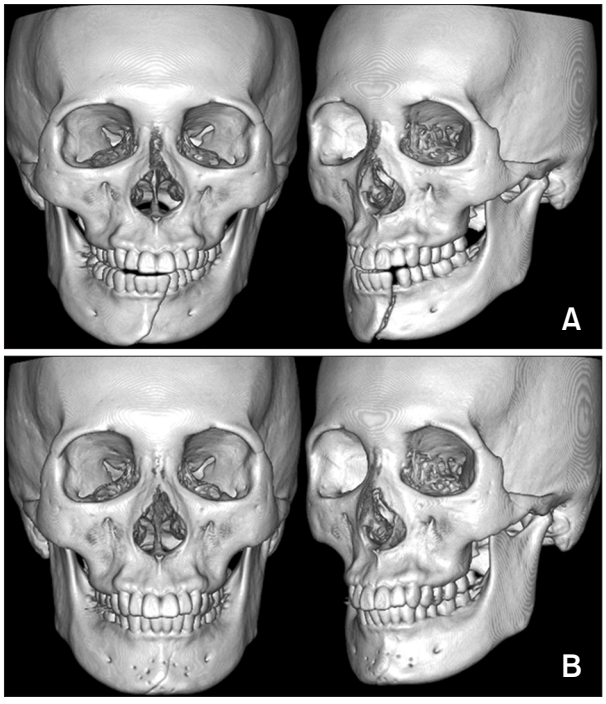

Fig. 2. (A) Computed tomography (CT) shows a mandible body fracture on the symphysis region. (B) Postoperative CT image shows favorable fixation of the mandible body.

no memory or experience of pain during surgery (visual analogue scale [VAS] score: 0).

2. *Case 2: Mandibular Parasymphysis Fracture*

A 19-year-old woman with no medical history was referred to the department of OMFS due to trauma caused by a motorcycle accident. One day before the consultation, emergency surgery for tibia fixation was performed by the orthopedic surgery department under general anesthesia. Intraoral exams showed an occulsal step and gap between the left mandibular incisor and canine. Through palpation, abnormal bone structures and mobility were noticed. The CT showed a comminuted mandible fracture on the parasymphysis region (Fig. 2A). Due to the patient and guardian's strong refusal to repeat general anesthesia, ORIF of the mandible was performed under MAC using dexmedetomidine and ketamine. Sedation was initiated with a bolus dose of continuous infusion dexmedetomidine (1 μg/kg) mixed with 100 ml of saline for ten minutes and ketamine (1 mg/kg) intravenously administered 1 minute before incision. Maintenance was provided by continuous dexmedetomidine (0.3~0.7 μg/kg/h) infusion adjusted accordingly to the response of the patient and required a supplemental dose of ketamine (30 mg) intravenously. ORIF was done via an intraoral access and the fractured parasymphysis was fixated with a 4-hole absorbable plate and four 6 mm screws (Fig. 2B). Perioperatively, oxygen saturation was well maintained by spontaneous respiration and the patient responded occasionally to stimulus. Postoperatively, the patient mentioned that she had no memory or pain during surgery (VAS score=0) and showed great satisfaction with the anesthetic procedure.

3. *Case 3: Alveolar Bone and Multiple Teeth Fracture*

A healthy 23-year-old woman who sustained maxillary and mandibular alveolar bone fracture and lip laceration by a car accident was referred to the department of OMFS. A 5 cm through-and-through laceration on the lower lip and mentum were present and teeth were avulsed and severely fractured (Fig. 3A). CT scans showed alveolar bone fractures on upper and lower jaws (Fig. 3B). The patient wanted to be treated painlessly but declined surgery under general anesthesia. Local anesthesia was attempted, but the patient could not bear the pain and consequently MAC was considered. The lacerations were sutured and hopeless teeth were extracted. An intraoral incision was made to elevate the gingiva and remove fractured bone fragments. After saline irrigation, suture was done to rearrange the torn gingiva (Fig. 3C). Sedation

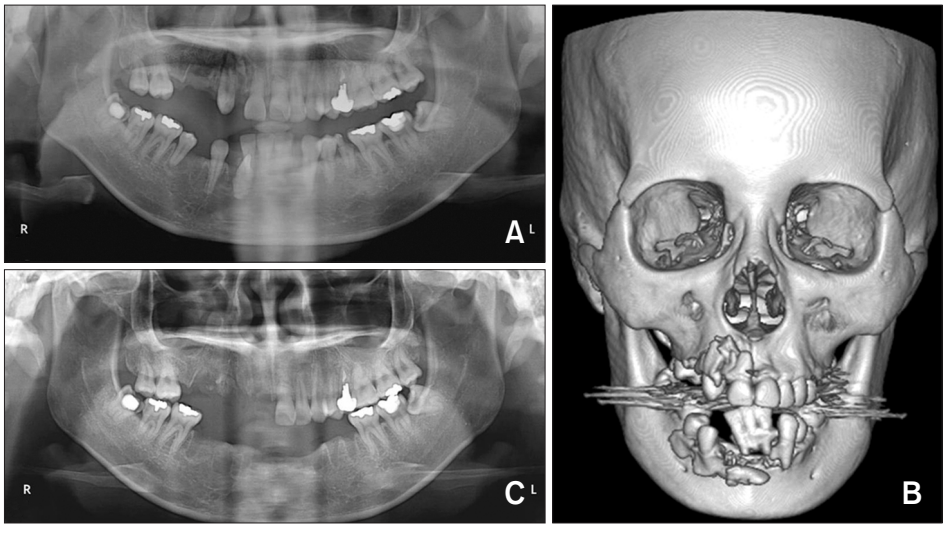

Fig. 3. (A) Preoperative panorama radiography shows alveolar fracture, teeth avulsion and teeth fracture. (B) Preoperative computed tomography (CT) image shows alveolar bone fracture on both jaws. (C) Postoperative panoramic radiography image shows good healing of the surgical site.

was initiated with a bolus dose of continuous infusion dexmedetomidine (1 μg/kg) mixed with 100 ml saline for ten minutes and ketamine (1 mg/kg) intravenous administered 1 minute before incision. Dexmedetomidine (0.3~0.7 μg/kg/h) was continuously infused during surgery for 1 hour. A total of three supplemental doses of ketamine (30 mg) was provided when the patient made notable reactions. During surgery, the patient appeared to be in an aroused state of sedation with spontaneous respiration and cooperated to the verbal commands at the end of the procedure. After surgery, the patient mentioned that she had minimal pain during surgery (VAS score=1) and had limited memory of the procedure.

Discussion

MAC provides conscious sedation in a variety of clinical scopes including minimally invasive surgery, interventional procedures, and gastrointestinal endoscopy. Dexmedetomidine was initially introduced two decades ago as a sedative and sedative supplement that could be used in the intensive care units for patients whose trachea was being intubated. Since then, the application of dexmedetomidine has been more commonly used as a sedative and hypnotic for patients undergoing invasive and noninvasive procedures regardless of the need for tracheal intubation[2]. Dexmedetomidine is a medication that appears to have great utility in areas of sedation[3,4].

Dexmedetomidine is a highly selective 2-adrenoceptor agonist with eight times higher receptor specificity compared to clonidine[5]. In addition to sedation, when used in adequate doses it produces analgesia which potentially alleviates postoperative pain while providing a narcotic sparing effect that has no deleterious clinical effects on respiration. This is why dexmedetomidine under MAC is noteworthy as a replacement for general anesthesia. For procedural sedation, a load of 1 μg/kg intravenous (IV) over 10 minutes with maintenance of 0.6 μg/kg/h IV titrated to effect is recommended. Still, subsequent studies in the adult population have demonstrated that dexmedetomidine may not be the optimal anesthesia agent for painful procedures. Dose elevations have been attempted to overcome this dilemma, but hemodynamic side effects such as bradycardia and hypotension occur as a result.

Ketamine is an alternative agent which takes the place of general anesthesia and can cover the side effects of dexmedetomidine. When used in combination, dexmedetomidine may limit tachycardia, hypertension, salivation and emergence phenomena from ketamine, whereas ketamine may prevent bradycardia and hypotension that have been reported complications with dexmedetomidine. An additional benefit by adding ketamine is that it speeds the process of sedation onset thereby prevailing the slow onset time of dexmedetomidine when used as a sole agent[6]. All of our cases had no significant hypotension or bradycardia throughout the procedure and all three patients experienced less pain and showed a higher level of satisfaction, even though in one case complete amnesia was not accomplished.

The 3 cases reported in this article have the common property of being frequent fracture types on jaw bones that require 1 hour of surgery through an intraoral approach. All 3 patients were sedative with minimal consciousness and preserved spontaneous breathing peri-operatively. All patients were responsive at the end of surgery when dexmedetomidine was stopped and no side effects after awakening were observed. We followed a regimen which was reportedly most effective by using of a bolus dose of both agents, dexmedetomidine (1 μg/kg) and ketamine (1 mg/kg), to initiate sedation followed by dexmedetomidine infusion (0.3~0.7 μg/kg/h) with supplemental bolus doses of ketamine (0.5 mg/kg) as needed[6,7]. The VAS scores of all 3 patients proved the sedation technique to be an effective regimen.

In conclusion, dexmedetomidine along with ketamine administration provides safe and effective sedation and anxiolysis for ORIF surgery in patients presenting with OMFS trauma. Thereby, dexmedetomidine in combination with ketamine may be an acceptable regimen for MAC that can be an alternative to general anesthesia, resulting in shorter procedure time and in-hospital stay, decreasing expenses, satisfying the anesthetic needs of the patients, and ultimately increasing overall satisfaction for both patient and surgeon.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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